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10/582,513	06/09/2006	Takanori Yamagishi	292380US0PCT	2912

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EXAMINER	
EOFF, ANCA	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/582,513	YAMAGISHI ET AL.	
	Examiner	Art Unit	
	ANCA EOFF	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/17/2009-*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-5,9,10 and 14-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-5,9,10 and 14-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 2-5, 9-10 and 14-16 are pending in the application. Claims 1, 6-8 and 11-13 have been canceled.

2. The foreign priority document JP 2003-413627 was received and acknowledged. However, in order to benefit of the earlier filing date, a certified English translation is required.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 17, 2009 has been entered.

Claim Rejections - 35 USC § 103

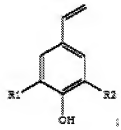
4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

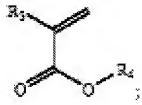
5. Claims 2-5, 9 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sounik et al. (US Pg-Pub 2004/0242798) in view of Sehm (US Patent 4,420,610) and in further view of Zampini et al. (US Patent 5,939,511).

With regard to claim 14, Sounik et al. disclose a method of preparing polymers of enhanced purity, said method including a solvent exchange process. The resultant polymer in solution can be used to prepare a photoresist composition (abstract).

The polymers include a structural unit (I):



(I) (unit (I) in par.0022), in combination with a (meth)acrylate monomer of the formula:



(II) (unit (II) in par.0023), wherein R^3 may be a hydrogen atom or methyl group (par.0034-0036) and R^4 may be a tert-butyl group, methyl-adamantyl or ethyl-adamantyl group (par.0038).

The polymers are equivalent to the resist polymer comprising a repeating unit decomposable by the action of an acid and a repeating unit with a polar group of the

instant application. Tthe hydroxystyrene unit is equivalent to the unit with a polar phenolic hydroxyl group and the (meth)acrylate unit with tert-butyl, methyladamatyl or ethyladamatyl group as R^4 is equivalent to the unit with acid-decomposable group.

Sounik et al. disclose that the polymer is dissolved in an solvent such as methanol (boiling point 64°C) (par.0021, par.0101 and par. 0121), equivalent to the solvent having a boiling point at atmospheric pressure not higher than the boiling point of a solvent for film-coating formation of the instant application.

In the solvent exchange step (also defined as Sounik et al. as solvent swap), the polymer is solvent exchanged with an organic solvent which is a photoresist compatible solvent and the methanol is removed by distillation (par.0121).The organic solvent may be propylene glycol monomethyl ether acetate (boiling point 146°C), equivalent to the solvent for coating-film formation of the instant application.

However, Sounik et al. does not specifically disclose the steps of the solvent exchange process.

Sehm disclose a solvent exchange process for polymer slurries (abstract), said slurries including methacrylate copolymers (column 3, lines 6-42). Sehm teaches that in a solvent exchange process, a solvent with lower boiling point is heated to distill off while it is replaced with liquid having higher boiling point (abstract and column 7, lines 38-45).

Since the Sounik et al. disclose that a solvent exchange is used in the polymer purification process, it would have been obvious to one of ordinary skill in the art at the time of the invention to perform the steps of the solvent exchange process of Sehm in

the polymer purification process of Sounik et al. (to add the PGMEA to the polymer solution simultaneously with the distillation of methanol).

However, Sounik nor Sehm disclose that the process is performed under pressure.

Zampini et al. disclose a process performed in the purification of novolak resins, wherein said novolak resins are used for preparing photoresist compositions (abstract). Zampini et al. teach that in a solvent exchange process a second solvent (PGMEA) is added to a solution of polymer and a first solvent and the first solvent is distilled under vacuum (column 12, line 51-column 13, line 16).

Since such process is successfully applied for purification of polymers for resist compositions, it would have been obvious to one of ordinary skill in the art at the time of the invention to perform a distillation under vacuum in the solvent exchange process of Sounik modified by Sehm, with a reasonable expectation of success.

Methanol has a boiling point of 64°C so the distillation of methanol occurs at the boiling temperature of 64°C. Therefore, the limitation of the instant application for the temperature being controlled at 70°C or less is met.

Based on the disclosure of Sounik et al., it is the examiner's position that the polymer does not contain any methanol after the solvent exchange/solvent swap process and therefore meets the limitation of claim 14.

With regard to claims 2 and 15, Sounik et al. disclose that photoresist compatible solvent is propylene glycol monomethyl ether acetate (PGMEA), which has a boiling point of 146°C and it is a linear compound with ether and ester polar groups.

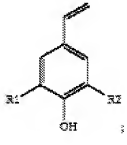
With regard to claims 3-4, Sounik et al. disclose polymers comprising the units (I) and (II) above, wherein:

-unit (I) is equivalent to the polar-group repeating unit of the instant application, the polar group being a phenolic hydroxyl group, and

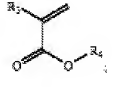
- unit (II) having R^4 a methyl-adamantyl or ethy-adamantyl group is equivalent to the repeating unit decomposable by the action of an acid and comprising an alicyclic skeleton with 5-20 carbons.

With regard to claim 5, Sounik et al. disclose that the solvent is used in amounts of about 300 to 2,000 parts, preferably 400 to 1,000 parts by weight per 100 parts by weight of the solids in the chemically amplified positive resist composition. The concentration is not limited to this range as long as film formation by existing methods is possible (par.0124).

With regard to claim 9, Sounik disclose polymers comprising a structural unit (I):



(I) (unit (I) in par.0022) in combination with an acrylate monomer of the formula:



(II) (unit (II) in par.0023), wherein R^3 may be a hydrogen atom or methyl group (par.0034-0036) and R^4 may be a tert-butyl group, methyl-adamantyl or ethyl-adamantyl group (par.0038).

While Sounik et al. do not specifically disclose a copolymer of hydroxystyrene and ethyladamantyl methacrylate, it would have been obvoious to one of ordinary skill in the art to obtain such a copolymer, the repeating units being clearly disclosed by Sounik et al. (par.0022-0023 and par.0038).

The copolymers of hydroxystyrene and ethyladamatyl methacrylate are identical to the polymers in Example 3 of the specification of the instant application (see page 21 and the tables 1 and 2 on pages 23-24). Absent a record to the contrary, it is the examiner's position that the copolymers of hydroxystyrene and ethyladamatyl methacrylate have the same properties as the copolymers of the instant application (MPEP 2112)

6. Claims 10 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sounik et al. (US Pg-Pub 2004/0242798) in view of Sehm (US Patent 4,420,610) and in further view of Zampini et al. (US Patent 5,939,511) as applied to claim 14 and in further view of Breyta et al. (US Patent 6,277,546).

With regard to claims 10 and 16, Sounik modified by Sehm and Zampini teach the process of claim 14 (see paragraph 5 above).Sounik et al. further disclose that the polymer is first dissolved in methanol but fail to teach that a solvent such as acetone, methyl ethyl ketone, tetrahydrofuran, ethylene glycol dimethyl ether or ethyl acetate can

be used for dissolving the hydroxystyrene- (meth)acrylate copolymer, as required by the instant application.

Breyta et al. teach a process for imaging a photoresist, wherein the photoresist may comprise a tert-butyl methacrylate/p-hydroxystyrene polymer (Examples V and VI in columns 9-10). Breyta et al. disclose that p-hydroxystyrene/methacrylate copolymers may be dissolved in acetone (column 10, lines 39-40).

Therefore, it would have been obvious to one of ordinary skill in the art to replace methanol with acetone in the process of Sounik modified by Sehm and Zampini, as acetone is taught by Breyta as solvent for p-hydroxystyrene/methacrylate copolymers.

With regard to claim 16, Sounik et al. further disclose that the photoresist compatible solvent is propylene glycol monomethyl ether acetate (PGMEA), equivalent to the coating film formation solvent of the instant application.

Response to Arguments

7. Applicant's arguments filed on February 17, 2009 have been fully considered but they are not persuasive.

On page 2 of the Remarks, the applicant shows independent claim 14, regarding a process of producing purified polymers for resist compositions and on pages 2-3, the applicant shows the difference between chemically amplified resist compositions ((i) on page 3) and novolac resist compositions ((ii) on page 3), underlining that the chemically amplified resist compositions and novolac resist compositions comprise different types of polymers.

On pages 3-4 of the Remarks, the applicant argues the Sounik reference. The applicant first states that the polymer of Sounik et al. is the same polymer as in the instant application.

The applicant further argues that:

- a carboxylic alcohol is used as first solvent in the purification step (page 5, par.0101),

- heptane, hexane (as a second solvent) is used in a purification step conducted after polymerization;

- an aprotic/organic solvent (third solvent) is used in a solvent exchange step.

The applicant further shows that the instant application uses MEK or other similar solvents as solvent (b) corresponding to the first solvent of Sounik and hydrous methanol as solvent (a), equivalent to the third solvent of Sounik.

However, the applicant further argues that the instant application does not have a solvent extraction step and does not use any solvent equivalent to the second solvent of Sounik et al.

In response to these arguments, the examiner would like to show the following:

Sounik et al. disclose that the polymer is dissolved in an solvent such as methanol (boiling point 64°C) (par.0021, par.0101 and par. 0121), equivalent to the solvent having a boiling point at atmospheric pressure not higher than the boiling point of a solvent for film-coating formation.

In the solvent exchange step, the polymer is solvent exchanged with an organic solvent which is a photoresist compatible solvent and the methanol is removed by

distillation (par.0121).The organic solvent may be propylene glycol monomethyl ether acetate (boiling point 146^{o}C), equivalent to the solvent for coating-film formation of the instant application.

As shown by the applicant, before the solvent exchange/solvent swap step, Sounik et al. perform a purification step by solvent separation using a second solvent (hexane, heptane, octane, petroleum ether, ligroin, lower alkyl halohydrocarbons and the like) and in said solvent separation step, by-products and low weight average molecular weight materials are removed (see par.0115, 0117). At the end of this purification step, the second solvent is removed (see par.0116).

The examiner would also like to point out that claim 14 contains the transitional phrase "comprising" which is an open-ended and allows for additional steps.

The transitional term "comprising", which is synonymous with "including," "containing," or "characterized by," is inclusive or open-ended and does not exclude additional, unrecited elements or method steps. See, e.g., > *Mars Inc. v. H.J. Heinz* Co., 377 F.3d 1369, 1376, 71 USPQ2d 1837, 1843 (Fed. Cir. 2004) ("like the term comprising,' the terms containing' and mixture' are open-ended.").< *Invitrogen Corp. v. Biocrest Mfg., L.P.*, 327 F.3d 1364, 1368, 66 USPQ2d 1631, 1634 (Fed. Cir. 2003) ("The transition comprising' in a method claim indicates that the claim is open-ended and allows for additional steps.") (MPEP 2111.03 Transitional Phrases)

Therefore, the process of Sounik et al. which comprises the additional step of purification by solvent extraction, as pointed out by the applicant, meets the limitation of claim 14 of the instant application.

On pages 4-5 of the Remarks, the applicant presents arguments concerning the Sehm reference.

Applicant argues that Sehm teaches a crosslinked carboxylic acid polymer which is different from the chemically amplified resist of the present application.

The process of Sehm uses MEK which dissolves both monomers and polymers.

Sehm uses mineral spirits as a solvent for removing the polymerization solvent.

The applicant further points out that Sehm is different from the instant application in terms of polymer used and properties of the solvent used for polymerization and the removal of the polymerization solvent.

The examiner would like to show the following:

Sounik et al. teach a process of purifying a polymer for resist composition by solvent exchange/solvent swap (par.0121) but do not specifically teach the steps of such process.

Sehm is only relied upon to show that a solvent exchange/solvent swap process is a process wherein a polymerization solvent is removed and replaced with mineral spirits simultaneously (column 7, lines 37-45). The polymerization solvent has a boiling point below that of mineral spirits and it distils off leaving the polymer in the mineral spirit (column 7, lines 18-23).

Shem clearly teaches that in a solvent exchange/swap a first solvent is replaced by a second solvent which is simultaneously fed while the first solvent is distilled off (column 7, lines 18-23 and 37-45).

Sounik et al. teach the solvent exchange/swap, wherein the alcoholic solvent (methanol, par.0101) is removed by distillation and the polymer is dissolved in a third solvent (PGMEA) (par.0121).

Based on Sounik's teaching and Sehm's definition of the solvent exchange, one of ordinary skill in the art would be motivated to add the PGMEA to the polymer solution simultaneously with the distillation of methanol.

On page 5, the applicant presents arguements concerning the Zampini reference.

The applicant argues that Zampini uses novolac resins of cresol and salicylaldehyde, while the instant application uses a chemically amplified resist. The polymerization solvent of Zampini et al. is an acidic solvent, different from the MEK (methyl ethyl ketone) of the instant application.

The applicant further shows that Zampini et al. teach that a method of removing an unwanted solvent is by diluting the solution with a photoresist solvent then vacuum distilling.

The applicant argues that the "applicability of such method to the present application is doubtful because the polymers used, namely their structures, are different between the two inventions" and further argues that such method is not shown in the Examples.

The examiner would like to point out the following:

Zampini et al. teach a method of purification of phenolic resins which are used for photoresist compositions (abstract). In the process of preparing novolak resin, the resins are dissolved in a solvent (column 12, line 64). When the novolak resin is used for a photoresist composition, the solution may be diluted with a photoresist solvent

(such as PGMEA) the (first unwanted) solvent is distilled under vacuum from the solution (column 13, lines 9-16).

One of ordinary skill in the art would imediately notice the similarity between the purification process of Sounik and Zampini, wherein a first solvent is replaced by a second solvent (solvent for photoresist) and the first solvent is distilled off. Therefore, one of ordinary skill in the art would be motivated to apply the teachings of Zampini et al. in the process of Sounik and perform the distillation under vacuum, with a reasonable expectation of success.

The examiner agrees that the polymers of Sounik and Zampini are different from each other (Sounik et al. teach copolymer of hydroxystyrenes with (meth)acrylates while Zampini et al. teach novolak resins). However, both references teach methods of purification for polymers used in resist compositions. Therefore, it is the examiner's position that one of ordinary skill in the art would have the motivation to combine the above-mentioned references.

On page 5, the applicant further argues that Zampini et al. do not teach the removing step conducted at a temperature of 70°C or lower.

The examiner would like to show that Sounik et al. teach that a solvent such methanol (boiling point 64°C) is used as first solvent and it is distilled off in a process of solvent exchange/swap (par.0101, 0121). As its is well-known in the art that a solvent distills off when it reaches the boiling point, it would be obvious to one of ordinary skill in the art to conduct the distillation of Sounik et al. at a temperature equal to the boiling temperature of said solvent.

In the process of Sounik et al., methanol will distill off at 64°C, which meets the limitation of the instant application for a temperature of 70°C or less.

On page 5 of the Remarks, the applicant states that the Breyta reference teaches that p-hydroxystyrene/methacrylate copolymers may be dissolved in acetone.

On pages 5-7, the applicant argues the combination of references.

At points (i)-(iii), the applicant argues that because the polymers have different structures, the methods of purification should vary accordingly. The applicant further argues that the functional groups of the polymers are expected to modify due to polymer dissolution.

The examiner would like to show that Sounik at al. and Sehm teach purification processes for polymer comprising methacrylate units. Both references teach a solvent exchange/solvent swap step in the process of polymer purification. Furthermore, as shown above at the response of arguments regarding the Sehm reference, the Sehm reference is only relied upon to specifically show the steps of a solvent exchange/swap process.

Sounik et al. and Zampini et al. both teach methods of purification for polymers used in resist compositions. It is the examiner's position that one of ordinary skill in the art would have the motivation to combine the above-mentioned references.

The applicant argues that the methods of purification should be different, considering the properties of the different polymers subjected to purification (see top of page 6). However, no evidence is provided in support of these argument.

The examiner maintains the position that one of ordinary skill in the art would be motivated to combine teachings regarding the purification of polymers for photoresist composition, especially since such references teach similar steps (Sounik and Zampini teach purification of polymers for resist compositions, said purification processes comprising solvent exchange/swap steps).

The applicant further argues the combination of Sounik et al. and Sehm. The examiner would like to underline the fact that Sehm is only relied upon to specifically show what steps are performed in a solvent exchange/swap process, since Sounik et al. only disclose the solvent exchange/swap without describing it.

At point (iv), the applicant argues that none of the references teach the removing step at a temperature of 70°C or lower.

The examiner agrees that the references do not specifically teach that the first solvent is removed at a temperature of 70°C or lower. However, Sounik et al. teach that a solvent such methanol (boiling point 64°C) is used as first solvent and it is distilled off in a process of solvent exchange/swap (par.0101, 0121). As its is well-known in the art that a solvent distills off when it reaches the boiling point, it would be obvious to one of ordinary skill in the art to conduct the distillation of Sounik et al. at a temperature equal to the boiling temperature of said solvent.

In the process of Sounik et al., methanol will distill off at 64°C, which meets the limitation of the instant application for a temperature of 70°C or less.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANCA EOFF whose telephone number is (571)272-9810. The examiner can normally be reached on Monday-Friday, 6:30 AM-4:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. E./
Examiner, Art Unit 1795

/Cynthia H Kelly/

Supervisory Patent Examiner, Art Unit 1795